

Patent claims

1. An electrochemical cell with a channel structure for the supply, circulation and discharge of fluids necessary for the operation of the cell, characterized in that, for the independent control of at least one fluid flow (5, 24, 33, 34), at least one element (4, 7, 8, 9-14, 22, 23, 29, 40, 48, 49) that changes the flow cross section is integrated in at least one channel (2, 15, 26, 27, 37) of the channel structure.
2. The electrochemical cell as claimed in claim 1, characterized in that, in the case of a cell with a channel (2, 37) formed in a separator plate (1), at least one bimetal element (4, 7, 8, 9-14, 40, 48, 49) is provided in the channel (2, 37).
3. The electrochemical cell as claimed in claim 2, characterized in that at least one bimetal element (4, 7, 8, 9-14, 40, 48, 49) that is adapted to the cross section of the channel (2, 37) is provided, the bimetal element (4, 7, 8, 9-14, 40, 48, 49) reducing the flow cross section of the channel (2, 37) by a thermally induced change in shape when there is a lowering of the fluid temperature.
4. The electrochemical cell as claimed in claim 3, characterized in that a separate, plate-shaped bimetal element (4) is fastened by one end to a channel wall (3).
5. The electrochemical cell as claimed in claim 3, characterized in that the bimetal element comprises a tongue-shaped notched portion (7) on a channel wall (3) and a plate-shaped element (8) connected to the notched portion (7) over its surface area.
6. The electrochemical cell as claimed in claim 2, characterized in that in the channel (2) a multiplicity of bimetal elements (9-14) are respectively fastened by one end to a channel wall (3), the bimetal elements (9-14) being raised when there is an increase in the temperature of the fluid (5).

7. The electrochemical cell as claimed in claim 1, characterized in that, in the case of a cell with a channel (15) formed in a separator plate (16), at least one element (22, 23, 29) which undergoes an increase in volume when there is an increase in moisture is provided in the channel (15).
8. The electrochemical cell as claimed in claim 7, characterized in that the element (22, 23) is fastened to a channel wall (20, 21).
9. The electrochemical cell as claimed in claims 7 and 8, characterized in that two elements (22, 23) are arranged in pairs lying opposite one another in the channel (15).
10. The electrochemical cell as claimed in claim 7, characterized in that the element (29) is integrated in a channel wall (28).
11. The electrochemical cell as claimed in claim 10, characterized in that the channel wall (28) of a fuel cell separates a cathode fluid channel (26) from a cooling fluid channel (27), the element (29) consisting of a water-permeable material, preferably a metal grid (31), on the side of the cathode fluid channel (26) and consisting of an elastic, water-impermeable material (30) on the side of the cooling fluid channel (27).
12. The electrochemical cell as claimed in claim 1, characterized in that, in the case of a cell with parallel channels (37) for a cooling fluid, each channel (37) is assigned at least one element (40, 48, 49).
13. The electrochemical cell as claimed in claim 1, characterized in that the elements (40, 48, 49) are integrated in channels (37) of a channel structure comprising a number of regions (45-47).

14. The electrochemical cell as claimed in claim 13, characterized in that, for the communication (42) of at least one of the fluids over different regions (45-47), there is a connection (41, 43, 44) between the channels (37).
15. The electrochemical cell as claimed in claim 14, characterized in that the communication (42) between the various regions (45-47) can be controlled by means of the elements (48, 49).
16. The electrochemical cell as claimed in claim 13, characterized in that the channels (37) run parallel in the direction of flow (39) of the fluid in a number of regions (45-47) and, after each region (45, 46) there are cross-connections (43, 44) of the channels (37), the elements (48, 49) being arranged in downstream regions (46, 47) for controlling the fluid flows region by region.
17. The electrochemical cell as claimed in claim 16, characterized in that the channels (37) run parallel in a first region, are in connection with one another via an aperture (41) in a second region and run parallel again in a third region, the elements (40) in the channels (37) being arranged in the third region.

New Patent claims

1. An electrochemical cell with a separator plate and a channel structure for the supply, circulation and discharge of fluids necessary for the operation of the cell, the channel structure being produced on the separator plate, characterized in that, for the independent control of at least one fluid flow (5, 24, 33, 34), at least one element (4, 7, 8, 9-14, 22, 23, 29, 40, 48, 49) that changes the flow cross section is integrated in at least one channel (2, 15, 26, 27, 37) of the channel structure.
2. The electrochemical cell as claimed in claim 1, characterized in that, in the case of a cell with a channel (2, 37) formed in a separator plate (1), at least one bimetal element (4, 7, 8, 9-14, 40, 48, 49) is provided in the channel (2, 37).
3. The electrochemical cell as claimed in claim 2, characterized in that at least one bimetal element (4, 7, 8, 9-14, 40, 48, 49) that is adapted to the cross section of the channel (2, 37) is provided, the bimetal element (4, 7, 8, 9-14, 40, 48, 49) reducing the flow cross section of the channel (2, 37) by a thermally induced change in shape when there is a lowering of the fluid temperature.
4. The electrochemical cell as claimed in claim 3, characterized in that a separate, plate-shaped bimetal element (4) is fastened by one end to a channel wall (3).
5. The electrochemical cell as claimed in claim 3, characterized in that the bimetal element comprises a tongue-shaped notched portion (7) on a channel wall (3) and a plate-shaped element (8) connected to the notched portion (7) over its surface area.
6. The electrochemical cell as claimed in claim 2, characterized in that in the channel (2) a multiplicity of bimetal elements (9-14) are respectively fastened by one end to a channel

wall (3), the bimetal elements (9-14) being raised when there is an increase in the temperature of the fluid (5).

7. The electrochemical cell as claimed in claim 1, characterized in that, in the case of a cell with a channel (15) formed in a separator plate (16), at least one element (22, 23, 29) which undergoes an increase in volume when there is an increase in moisture is provided in the channel (15).
8. The electrochemical cell as claimed in claim 7, characterized in that the element (22, 23) is fastened to a channel wall (20, 21).
9. The electrochemical cell as claimed in claims 7 and 8, characterized in that two elements (22, 23) are arranged in pairs lying opposite one another in the channel (15).
10. The electrochemical cell as claimed in claim 7, characterized in that the element (29) is integrated in a channel wall (28).
11. The electrochemical cell as claimed in claim 10, characterized in that the channel wall (28) of a fuel cell separates a cathode fluid channel (26) from a cooling fluid channel (27), the element (29) consisting of a water-permeable material, preferably a metal grid (31), on the side of the cathode fluid channel (26) and consisting of an elastic, water-impermeable material (30) on the side of the cooling fluid channel (27).
12. The electrochemical cell as claimed in claim 1, characterized in that, in the case of a cell with parallel channels (37) for a cooling fluid, each channel (37) is assigned at least one element (40, 48, 49).

13. The electrochemical cell as claimed in claim 1, characterized in that the elements (40, 48, 49) are integrated in channels (37) of a channel structure comprising a number of regions (45-47).
14. The electrochemical cell as claimed in claim 13, characterized in that, for the communication (42) of at least one of the fluids over different regions (45-47), there is a connection (41, 43, 44) between the channels (37).
15. The electrochemical cell as claimed in claim 14, characterized in that the communication (42) between the various regions (45-47) can be controlled by means of the elements (48, 49).
16. The electrochemical cell as claimed in claim 13, characterized in that the channels (37) run parallel in the direction of flow (39) of the fluid in a number of regions (45-47) and, after each region (45, 46) there are cross-connections (43, 44) of the channels (37), the elements (48, 49) being arranged in downstream regions (46, 47) for controlling the fluid flows region by region.
17. The electrochemical cell as claimed in claim 16, characterized in that the channels (37) run parallel in a first region, are in connection with one another via an aperture (41) in a second region and run parallel again in a third region, the elements (40) in the channels (37) being arranged in the third region.